## Decision Rationale

## Total Maximum Daily Loads for
## The Primary Contact (Bacteriological) and Aquatic Life Use Impairments on
## Callahan Creek Wise County, Virginia

### I. Introduction

The Clean Water Act (CWA) requires a Total Maximum Daily Load (TMDL) be developed for those water bodies identified as impaired by a state where technology-based and other controls will not provide for attainment of water quality standards. A TMDL is a determination of the amount of a pollutant from point, nonpoint, and natural background sources, including a margin of safety (MOS), that may be discharged to a water quality-limited water body.

This document will set forth the U. S. Environmental Protection Agency's (EPA) rationale for approving the TMDLs for the primary contact (bacteriological) and aquatic life use impairments on Callahan Creek. EPA's rationale is based on the determination that the TMDLs meet the following eight regulatory conditions pursuant to 40 CFR §130.

1) The TMDLs are designed to implement applicable water quality standards.
2) The TMDLs include a total allowable load as well as individual waste load allocations (WLAs) and load allocations (LAs).
3) The TMDLs consider the impacts of background pollutant contributions.
4) The TMDLs consider critical environmental conditions.
5) The TMDLs consider seasonal environmental variations.
6) The TMDLs include a MOS.
7) There is reasonable assurance that the TMDLs can be met.
8) The TMDLs have been subject to public participation.

### II. Background

The Callahan Creek Watershed is located in Wise County in southwestern Virginia. Callahan Creek is a tributary to the Powell River in the Tennessee/Big Sandy Basin. The benthic impairment on Callahan Creek extends 1.68 miles from its confluence with Preacher Creek to its mouth at the Powell River. The bacteria impairment begins upstream of the benthic impairment and runs 5.12 miles from the bridge at Route 600 to its mouth. The watershed is rural with forested and mined lands making up over 95 percent of the watershed area.

In response to Section 303(d) of the CWA, the Virginia Department of Environmental Quality (VADEQ) listed Callahan Creek (VAS-P17R) on Virginia's 1996 Section 303(d) list as being unable to attain the general standard due to an aquatic life use impairment identified through benthic assessments. The bacteriological impairment was first identified on Virginia's 2004 Section 303(d) list. At the time of assessment, the bacteria criteria used fecal coliform as an indicator species and had an instantaneous standard 1,000 colony forming units (cfu) per 100 milliliters (ml) and a geometric mean standard of 200 cfu/100ml. This decision rationale will address the TMDLs for both impairments.

Fecal coliform is a bacterium which can be found within the intestinal tract of all warm blooded animals. Fecal coliform indicates the presence of fecal wastes and the potential for the existence of other pathogenic bacteria. The higher concentrations of fecal coliform indicate the elevated likelihood of increased pathogenic organisms.

EPA encouraged the states to use e-coli and enterococci as the indicator species instead of fecal coliform. A better correlation was drawn between the concentrations of e-coli and enterococci, and the incidence of gastrointestinal illness. The Commonwealth adopted e-coli and enterococci criteria in January 2003. According to the new criteria, streams are evaluated via the e-coli and enterococci criteria after 12 samples have been collected using these indicator species. Twelve e-coli samples have been collected from Callahan Creek and it is therefore, assessed, according to the new criteria.

As Virginia designates all of its waters for primary contact, all waters are required to meet the bacteriological standard for primary contact. Virginia's standard applies to all streams designated as primary contact for all flows. The e-coli criteria requires a geometric mean concentration of 126 cfu/100ml of water with no sample exceeding 235 cfu/100 ml of water. The new e-coli criterion requires the concentration of e-coli not to exceed 235 cfu/100ml of water.

Although the TMDL and criteria require the 235 cfu/100 ml of water concentration limit not be exceeded, waters are not placed on the Section 303(d) list if their violation rate does not exceed 10 percent. Therefore, Callahan Creek may be deemed as attaining its primary contact use prior to the implementation of all of the TMDL reductions. It is necessary to keep this in mind because the reductions required to attain the instantaneous criteria for e-coli in the model are extremely stringent. Based on the model, the removal of all straight pipes coupled with a 15 percent bacteria reduction from urban and agricultural lands will reduce the violation to 10 percent alone.

To assess the biological integrity of a stream, Virginia uses EPA's Rapid Bioassessment Protocol II (RBPII) to determine status of a stream's benthic macroinvertebrate community.[1] This approach evaluates the benthic macroinvertebrate community between a monitoring site and its reference station. Measurements of the benthic community, called metrics, are used to identify differences between monitored and reference stations.[2] The state is currently in the

---

[1]Tetra Tech 2002. Total Maximum Daily Load (TMDL) Development for Blacks Run and Cooks Creek. Fairfax, Virginia.

process of changing this methodology to a stream condition index (SCI) approach.

As part of the RBPII approach, reference stations are established on streams which are minimally impacted by humans and have a healthy benthic community. These reference stations represent the desired community for the monitored sites. Monitored sites are evaluated as non-impaired, slightly impaired, moderately impaired, or severely impaired based on a comparison of the biological community of the reference and monitored sites. Streams that are classified as moderately (after a confirmatory assessment) or severely impaired after an RBPII evaluation are classified as impaired and are placed on the Section 303(d) list of impaired waters. Callahan Creek has consistently been assessed as moderately impaired. The SCI assessment method evaluates Callahan Creek as being impaired as well. The area has been intensively mined in the past and these operations continue.

The RBPII analysis assesses the health of the macroinvertebrate community of a stream. The analysis will inform the biologist if the stream's benthic community is impaired. However, it will not inform the biologist as to what is necessarily causing the degradation of the benthic community. Additional analysis may be required to determine the pollutants which are causing the impairment as information can be gleaned based on the composition of the community and the condition of the habitat. TMDL development requires the identification of impairment causes and the establishment of numeric endpoints that will allow for the attainment of designated uses and water quality criteria.[3] Additional water quality data has been collected from Callahan Creek as a result of the mining activities.

A reference watershed approach was used to determine both the stressors and numeric endpoints for the pollutants impacting Callahan Creek. Stressors are the pollutants which are impacting the benthic community of the stream. Numeric endpoints represent the water quality goals that are to be achieved through the implementation of the aquatic life use TMDL which will allow the impaired water to attain its designated use. A reference watershed approach is based on selecting a non-impaired watershed that shares similar landuse, ecoregion, and geomorphological characteristics with the impaired watershed. The stream conditions and loadings in the reference stream are assumed to be the conditions needed for the impaired stream to attain standards. Therefore, the TMDL intends to replicate the loadings of the reference watershed in the impaired watershed to allow it to attain criteria.

The bacteriological TMDL submitted by Virginia is designed to determine the acceptable load of e-coli which can be delivered to the impaired segment, as demonstrated by the Hydrologic Simulation Program Fortran (HSPF) model, in order to ensure that the water quality standard is attained and maintained. HSPF was considered an appropriate model to analyze the impaired water because of its dynamic ability to simulate both watershed loading and receiving

---

[2]Ibid 1

[3]Ibid 1

water quality over a wide range of conditions. The model was run to determine the fecal coliform loading to Callahan Creek as most of the loading information and sampling results are based on fecal coliform. The in-stream fecal coliform concentrations were then converted to e-coli using a conversion factor established by the Commonwealth.

The bacteriological TMDL analysis allocates the application/deposition of fecal coliform to land-based and in-stream sources. For land-based sources, the model accounts for the buildup and washoff of pollutants from these areas. Buildup (accumulation) refers to the complex spectrum of dry-weather processes that deposit or remove (die-off) pollutants between storms.[4] Washoff is the removal of fecal coliform which occurs as a result of runoff associated with storm events. These two processes allow the model to quantify the amount of fecal coliform from land-based sources which is reaching the stream. Point sources and wastes deposited directly to the stream were treated as direct deposits. Wastes which are deposited directly to the stream do not need a transport mechanism.

Local rainfall and temperature data were needed to develop the model. Weather data provides the rainfall data which drives the TMDL model. Weather data was obtained from the Big Stone Gap weather station. Continuous stream flow data was not available for Callahan Creek. However, there was a gage on the Upper Powell River. This United States Geological Survey (USGS) gage 03529500 operated sporadically from 1944 through 2003. A regression analysis was drawn from the flow data collected at this gage and the continuous USGS gage 03531500 on the Powell River. Through this process a continuous observed flow record from 1944 through 2003 was established for the Upper Powell River gage. The bacteria TMDL used this continuous gage data to develop the hydrology model. The bacteria loading model was calibrated and validated against observed data from the VADEQ monitoring stations within the Callahan Creek Watershed.

The benthic TMDL was developed using both the Generalized Watershed Loading Function (GWLF) model and HSPF. There were two pollutants found to be impacting Callahan Creek. The HSPF model was used to model the loading of total dissolve solids (TDS) one of the pollutants impacting the stream. The GWLF model was used to model the sediment loading to Callahan Creek. The GWLF model provides the ability to simulate runoff, sediment, and nutrient loadings from watersheds given variable source areas (e.g., agricultural, forested, and

---

[4]CH2MHILL, 2000. Fecal Coliform TMDL Development for Cedar, Hall, Byers, and Hutton Creeks Virginia,

developed land).[5] GWLF is a continuous simulation model that uses daily time steps for weather data and water balance calculations.[6] Calculations are made for sediment based on daily water balance totals that are summed to give monthly values.

A reference watershed approach was used to estimate the necessary load reduction needed to restore a healthy aquatic community and allow Callahan Creek to achieve its designated uses. Middle River was used as the loading reference watershed to Callahan Creek. Middle River was chosen as the loading reference watershed because it was previously assessed as having an impaired benthic community. However, restoration work associated with mining activities in the watershed has allowed Middle River to attain the general standard for the aquatic life use. McClure River was the reference watershed used for the stressor analysis. McClure River is a similar watershed to Middle River and also supports a healthy benthic community. Possible stressors for Callahan Creek were evaluated against their observed concentrations in McClure River when numeric criteria were unavailable. Table 1 identifies the TMDL loadings to Callahan Creek.

Table 1 - Summarizes the Specific Elements of the TMDL.

| Segment | Parameter | TMDL | WLA | LA | MOS |
|---|---|---|---|---|---|
| Callahan Creek | E-coli (cfu/yr) | 7.69E+12 | 1.74E+09 | 7.69E+12 | Implicit |
| | TDS (kg/yr) | 2.81E+06 | 2.61E+06 | 1.96E+05 | Implicit |
| | Sediment (Mg/yr) | 7,713 | 113 | 6,828 | 771 |

The United States Fish and Wildlife Service has been provided with a copy of these TMDLs.

## III. Discussion of Regulatory Conditions

EPA finds that Virginia has provided sufficient information to meet all of the eight basic requirements for establishing primary contact (bacteriological) and aquatic life (benthic) use impairment TMDLs for Callahan Creek. EPA is therefore approving the TMDLs. EPA's approval is outlined according to the regulatory requirements listed below.

*1) The TMDLs are designed to meet the applicable water quality standards.*

---

[5]Ibid 1

[6]Ibid 1

Bacteria

Virginia has indicated that excessive levels of fecal coliform due to nonpoint sources (both wet weather and directly deposited nonpoint sources) and illegal dischargers have caused violations of the water quality criteria and designated uses on Callahan Creek. The water quality criterion for fecal coliform was a geometric mean 200 cfu/100ml or an instantaneous standard of no more than 1,000 cfu/100ml. Two or more samples over a 30-day period are required for the geometric mean standard. Since the state rarely collects more than one sample over a 30-day period, most of the samples were measured against the instantaneous standard.

The Commonwealth has changed its bacteriological criteria as indicated above. The new e-coli criterion requires a geometric mean of 126 cfu/100ml of water with no sample exceeding 235 cfu/100 ml. The new criterion is more stringent and if the loading remains constant the violation rate should increase.

The HSPF model was used to determine the fecal coliform deposition rates to the land as well as loadings to the stream from direct deposit sources. Once the existing load was determined, allocations were assigned to each source category to develop a loading pattern that would allow Callahan Creek to support the e-coli water quality criterion and primary contact use. The following discussion is intended to describe how controls on the loading of e-coli to Callahan Creek will ensure that the criterion is attained. Bacteria violations were observed in all flows in both the observed and simulated data.

The TMDL modelers determined the fecal coliform production rates within the watershed. Data used in the model was obtained from a wide array of sources, including farm practices in the area, the amount and concentration of farm animals, animal access to the stream, wildlife in the watershed, wildlife fecal production rates, landuses, weather, stream geometry, etc.. The model combined all of the data to determine the hydrology and water quality of the stream. The lands within the watersheds were categorized into specific landuses. The landuses had specific loading rates and characteristics that were defined by the modelers. Therefore, the loading rates are different in lands defined as forested versus pasture. Pasture lands support cattle and are influenced differently by stormwater runoff.

The Callahan Creek bacteria TMDL model was run using weather data collected from the Big Stone Gap weather station. This data was used to determine the precipitation rates in the watershed which transport land deposited pollutants to the stream through overland and groundwater flow. Waste that was deposited to the land or stored was subjected to a die-off rate. The longer fecal coliform stayed on the ground the greater the die-off. Materials that were washed off the surface shortly after deposition were subjected to less die-off. The hydrology model of the TMDL was calibrated to an observed USGS gage from the Upper Powell River which is located near the mouth of Callahan Creek. The hydrology model was calibrated to data collected from 2001 through 2003. During this process, model parameters are adjusted within a reasonable range to develop a simulated flow that follows similar patterns to the observed flows monitored at the gauging station.

The water quality model for bacteria was calibrated to observed data collected from Callahan Creek. The water quality model was calibrated to observed data from 2001 through 2003. Unlike the hydrology data, the water quality data were grab samples and not daily averages as were used in the model output. Therefore, they represent a snapshot of the water quality for that specific date and time, while the model attempts to represent the general daily condition. The calibration did correspond to the overall trends observed in the monitoring data. It is believed that since the model accurately reflects both the observed flow and water quality data, that that can accurately project water quality conditions under different loading scenarios. All of the bacterial loadings to the stream were adjusted until a allocation scenario that attained the applicable water quality criteria was found.

Through the development of this and other similar TMDLs, it was discovered that natural conditions (wildlife contributions to the streams) could cause or contribute to violations of the bacteria criteria as it is currently written. Many of Virginia's TMDLs, including the TMDL for Callahan Creek, have called for some reduction in the amount of wildlife contributions. It should be noted according to the TMDL analysis, the removal of straight pipes and a 15 percent reduction in urban and agricultural loads in the watershed will allow for the attainment of the geometric mean criterion and a 90 percent adherence to the instantaneous criteria. EPA believes that a significant reduction in wildlife is not practical and will not be necessary due to the implementation plan discussed below.

A phased implementation plan will be developed for all streams in which the TMDL calls for reductions in wildlife. In Phase 1 of the implementation, the Commonwealth will begin implementing the reductions (other than wildlife) called for in the TMDL. In Phase 2, which can occur concurrently to Phase 1, the Commonwealth will consider addressing its standards to accommodate this natural loading condition. The Commonwealth has indicated that during Phase 2, it may develop a Use Attainability Analysis (UAA) for streams with wildlife reductions which are not used for frequent bathing. Depending upon the result of the UAA, it is possible that these streams could be designated for secondary contact.

After the completion of Phase 1 of the implementation plan, the Commonwealth will monitor the stream to determine if the wildlife reductions are actually necessary, as the violation level associated with the wildlife loading may be smaller than the percent error of the model. In Phase 3, the Commonwealth will investigate the sampling data to determine if further load reductions are needed in order for these waters to attain standards. If the load reductions and/or the new application of standards allow the stream to attain standards, then no additional work is warranted. However, if standards are still not being attained after the implementation of Phases 1 and 2, further work and reductions will be warranted.

Benthic

As stated above, the biological assessments on Callahan Creek were not able to discern a clear stressor to the Creek. The TMDL modelers therefore conducted a stressor identification analysis to determine what was impacting the benthic community. Current ambient water quality data was able to rule out dissolved oxygen, temperature, nutrients or pH as possible stressors to Callahan Creek. Although nitrogen levels in the watershed were high, phosphorous is the limiting nutrient and its loading were low. Therefore, nutrients were ruled out as a stressor. Mining operations in the watershed have increased the sulfate, sediment and metals load to the stream and these are the pollutants the stressor identification further targeted for evaluation.

McClure River was used as the reference watershed for the stressor identification study. This 90$^{th}$ percentile of water quality data collected from this unimpaired watershed was used to determine if a pollutant was a stressor. Pollutants that were consistently above the 90$^{th}$ percentile of McClure River were viewed as possible or probable stressors. Iron and manganese were both encountered in Callahan Creek at concentrations well in excess of their 90$^{th}$ percentile concentration in McClure Creek. Iron was ruled out as a stressor because it was not covering habitat and smothering organisms, which was documented in the applicable literature as the means by which iron negatively impacts benthic organisms. Manganese was not seen as a factor since its median concentrations matched the 90$^{th}$ percentile loading at McClure Creek. Sediment samples collected from a VADEQ monitoring station on Callahan Creek in 2004 revealed that all of the metals were at concentrations below the probable effect concentration. The biological assemblage at the VADEQ monitoring also revealed the presence of some species which are sensitive to metals. Therefore, metals were ruled out as a possible stressor.

Based on habitat assessments and/or water quality data TDS and sediment were determined to be the most probable stressors to Callahan Creek. Habitat assessments conducted with recent benthic assessments did not evaluate the habitat as marginal regarding sediment, the monitoring sites had optimal and sub-optimal scores for embeddedness and pool sediment. Although, Virginia does not have a numeric criterion for sediment, EPA notes that total suspended solid (TSS) concentrations as high as 25 mg/L are acceptable for flowing streams and the 90$^{th}$ percentile for TSS on the McClure River was 25 mg/L. This threshold was exceeded once in the data collected by VADEQ from 2001 through 2003. Data collected from the permitted mining facilities consistently revealed TSS concentrations in excess of 25 mg/L. Based on this data, sediment as monitored through TSS was seen as a stressor.

Although, Virginia does not have a numeric water quality criterion for TDS, other states do (Ohio's and Illinois' criteria are both1,500 mg/L). The concentrations observed on Callahan Creek did not exceed this threshold but came very close. They also exhibited a lot of volatility which is damaging to the benthic community as well. Therefore, the benthic TMDL was created to control TDS as well.

The GWLF model was used to determine the loading rates of sediment to the impaired and reference streams from all point and nonpoint sources. The TMDL modelers determined the sediment loading rates within each watershed. Data used in the model was obtained on a wide array of items, including landuses in the area, point sources in the watershed, weather, stream geometry, etc..

The GWLF model provides the ability to simulate runoff and sediment loadings from watersheds given variable source areas (e.g., agricultural, forested, and developed land). GWLF is a continuous simulation model that uses daily time steps for weather data and water balance calculations.[7] Local rainfall and temperature data were needed to simulate the hydrology. This data was obtained from the National Climatic Data Center (NCDC) station 440735 for Callahan Creek. In the GWLF model, the nonpoint source load calculation is affected by terrain conditions, such as the amount of vegetative, land slope, soil erodibility, and land practices used in the area.[8] Parameters within the model account for these conditions and practices. Although the GWLF model was developed for ungaged watersheds, the model was calibrated to observed data collected at the same USGS gage as the HSPF model. To model TDS, the HSPF model was used. Middle Creek was also modeled using the GWLF model for sediment. The endpoint for TDS in Callahan Creek was 334 mg/L which is the 90$^{th}$ percentile of TDS concentrations for Middle Creek. It is believed that this concentration will allow for the attainment of a healthy benthic assemblage since Middle Creek is non-impaired. The TSS/sediment loading for Callahan Creek was based on the average annual sediment load delivered to Middle Creek as determined by the GWLF model this model used NCDC station 447174 for weather data.

*2) The TMDLs include a total allowable load as well as individual waste load allocations and load allocations.*

Total Allowable Loads

Virginia indicates that the total allowable loading is the sum of the loads allocated to land-based precipitation driven nonpoint source areas (forest and agricultural land segments) and point sources. Activities that increase the levels of bacteria and sediment to the land surface or their availability to runoff are considered flux sources. The actual value for total loading can be found in Table 1 of this document. The total allowable load is calculated on an annual basis.

Waste Load Allocations

There was one National Pollutant Discharge Elimination System (NPDES) permitted facility identified as discharging bacteria to Callahan Creek. The facility was provided with a WLA allocation that was equal to its permitted flow and bacteria concentrations. There are several facilities which discharge TDS and TSS to Callahan Creek. These facilities include three deep mining operations, one residential waste discharge permit and several surface mine runoff collection ponds. Mining operations have surface ponds that collect and treat surface runoff from the mining site. When the mine operation is completed, these ponds are closed and their

---

[7]Ibid 1

[8]Ibid 1

discharge is ceased. However, new areas may be re-mined and a new pond is created. A runoff event is required for these facilities to discharge to Callahan Creek. The current permit for these facilities requires that they discharge sediment in the form of TSS at 70 mg/L or less. The WLA called for no reductions in their current sediment load. None of the mining facilities currently monitor for TDS. Therefore, their current loading is not known, but a total loading to all of the facilities was provided. It is not known whether the facilities are currently achieving this lumped WLA, but monitoring has been initiated. The WLAs for both sediment and TDS were provided as a lumped load based on the nature of the dischargers. This lumped WLA can not be exceeded by the aggregate of all point sources. Table 2 documents the WLAs and permits.

EPA regulations require that an approvable TMDL include individual WLAs for each point source. According to 40 CFR 122.44(d)(1)(vii)(B), "Effluent limits developed to protect a narrative water quality criterion, a numeric water quality criterion, or both, are consistent with assumptions and requirements of any available WLA for the discharge prepared by the state and approved by EPA pursuant to 40 CFR 130.7." Furthermore, EPA has authority to object to the issuance of any NPDES permit that is inconsistent with the WLAs established for that point source.

Table 2 – WLAs for Callahan Creek

| Source | Pollutant | Load |
|---|---|---|
| Lumped Mining Operations | TDS | 2.61E+06 kg/yr |
| Lumped Mining Operations | Sediment | 107 Mg/yr |
| VA0002212 | Sediment | 5.39 Mg/yr |
| VAR103468 | Sediment | 0.28 Mg/yr |
| VAG400340 | Sediment | 0.04 Mg/yr |
| | Bacteria | 1.74E+09 (cfu/yr) |

Load Allocations

According to Federal regulations at 40 CFR 130.2(g), LAs are best estimates of the loading, which may range from reasonably accurate estimates to gross allotments, depending on the availability of data and appropriate techniques for predicting loading. Wherever possible, natural and nonpoint source loads should be distinguished.

In order to accurately simulate landscape processes and nonpoint source loadings of bacteria, VADEQ used the HSPF model to represent the impaired watersheds. The HSPF model is a comprehensive modeling system for the simulation of watershed hydrology, point and nonpoint source loadings, and receiving water quality. HSPF uses precipitation data for continuous and storm event simulation to determine total loading to the impaired segments from the various land uses within the watershed.

For the sediment TMDL the GWLF model was used to ascertain the sediment loading to Callahan Creek and Middle River the reference watershed. The model provides the monthly sediment load to the stream through the use of the universal soil loss equation (USLE). The USLE derives the sediment loading by using information on precipitation rates, best management practices, land slope, and vegetative cover. Tables 3a, b and c identify the current and TMDL loading for bacteria, TDS and sediment to Callahan Creek.

Table 3a - LA for Bacteria (E-coli) for Callahan Creek

| Source Category | Existing Load (cfu/yr) | Allocated Load (cfu/yr) | Percent Reduction |
|---|---|---|---|
| Cropland | 1.74E+12 | 1.74E+10 | 99 |
| Active Mining | 1.10E+13 | 1.10E+11 | 99 |
| Barren | 9.31E+12 | 9.31E+10 | 99 |
| Commercial | 1.83E+12 | 1.83E+12 | 99 |
| Livestock Access | 1.27E+12 | 1.27E+10 | 99 |
| Forest | 1.53E+14 | 7.06E+13 | 46 |
| Pasture | 1.89E+13 | 1.89E+11 | 99 |
| Reclaimed | 2.37E+12 | 1.09E+12 | 46 |
| Residential | 2.12E+13 | 2.12E+11 | 99 |
| Roads and Transitional | 6.68E+12 | 6.68E+10 | 99 |
| Wetlands | 6.40E+11 | 2.94E+11 | 46 |

Table 3b - LA for Sediment for Callahan Creek

| Source Category | Existing Load (Mg/yr) | Proposed Load (Mg/yr) | Percent Reduction |
|---|---|---|---|
| Abandoned Mine Lands | 2,573 | 1,119 | 56.5 |
| Commercial | 6.5 | 6.5 | 0 |
| Cropland | 2,359 | 2,359 | 0 |
| Forest, Undisturbed | 1,693 | 1,693 | 0 |
| Forest, Disturbed | 11,787 | 1,532 | 87 |
| Forest, Undisturbed | 17 | 17 | 0 |
| Pasture Hay | 102 | 102 | 0 |
| Channel Erosion | 2.18 | 2.18 | 0 |

| | | | |
|---|---|---|---|
| Straight Pipes | 18.9 | 0 | 100 |

Table 3c – LA for TDS for Callahan Creek

| Source Category | Proposed Load |
|---|---|
| Nonpoint Sources | 1.96E+05 kg/yr |
| Point Sources | 2.61E+06 kg/yr |

*3) The TMDLs consider the impacts of background pollution.*

The TMDL considers the impact of background pollutants by considering the bacteria and sediment loadings from background sources like wildlife and forested lands and calibrating the model to observed conditions.

*4) The TMDLs consider critical environmental conditions.*

According to EPA's regulation 40 CFR 130.7 (c)(1), TMDLs are required to take into account critical conditions for stream flow, loading, and water quality parameters. The intent of this requirement is to ensure that the water quality of Callahan Creek is protected during times when it is most vulnerable.

Critical conditions are important because they describe the factors that combine to cause a violation of water quality standards and will help in identifying the actions that may have to be undertaken to meet water quality standards[9]. Critical conditions are a combination of environmental factors (e.g., flow, temperature, etc.), which have an acceptably low frequency of occurrence. In specifying critical conditions in the waterbody, an attempt is made to use a reasonable "worst-case" scenario condition. For example, stream analysis often uses a low-flow (7Q10) design condition because the ability of the waterbody to assimilate pollutants without exhibiting adverse impacts is at a minimum.

The HSPF and GWLF models were run over a multi-year period to insure that they accounted for a wide range of climatic conditions. The allocations developed in these TMDLs will therefore insure that the criteria are attained over a wide range of environmental conditions including wet and dry weather conditions.

*5) The TMDLs consider seasonal environmental variations.*

Seasonal variations involve changes in stream flow and loadings as a result of hydrologic

[9]EPA memorandum regarding EPA Actions to Support High Quality TMDLs from Robert H. Wayland III, Director, Office of Wetlands, Oceans, and Watersheds to the Regional Management Division Directors, August 9, 1999.

and climatological patterns.  In the continental United States, seasonally high flows normally occur in early spring from snow melt and spring rain, while seasonally low flows typically occur during the warmer summer and early fall drought periods.

Bacteria loadings also change during the year based on crop cycles, waste application rates, vegetative cover and cattle access patterns.  Consistent with the discussion regarding critical conditions, the HSPF and GWLF models and TMDL analysis effectively considered seasonal environmental variations through the use of observed weather data over an extended period of time and by modifying waste application rates, crop cycles, and livestock practices.

*6)  The TMDLs include a margin of safety.*

This requirement is intended to add a level of safety to the modeling process to account for any uncertainty.  The MOS may be implicit, built into the modeling process by using conservative modeling assumptions, or explicit, taken as a percentage of the WLA, LA, or TMDL.  Virginia included an implicit MOS in the bacteria and TDS TMDLs through the use of conservative modeling assumptions such as modeling the point sources as discharging at their permitted maximums.  An explicit 10 percent MOS was used for the sediment TMDL.

*7)  There is a reasonable assurance that the TMDLs can be met.*

EPA requires that there be a reasonable assurance that the TMDLs can be implemented. WLAs will be implemented through the NPDES permit process.  According to 40 CFR 122.44(d)(1)(vii)(B), the effluent limitations for an NPDES permit must be consistent with the assumptions and requirements of any available WLA for the discharge prepared by the state and approved by EPA.  Furthermore, EPA has authority to object to issuance of an NPDES permit that is inconsistent with WLAs established for that point source.

Nonpoint source controls to achieve LAs can be implemented through a number of existing programs such as Section 319 of the CWA, commonly referred to as the Nonpoint Source Program.

*8)  The TMDLs have been subject to public participation.*

During the development of the TMDLs for the Callahan Creek Watershed, public involvement was encouraged through two public meetings and comment periods used to discuss and disseminate the TMDLs.  A basic description of the TMDL process and the agencies involved was presented at the first public meeting on August 10, 2004 at the Appalachia Cultural Arts Center in Appalachia, Virginia with 18 people in attendance.  The second and final public meeting was held on February 22, 2005 at the First Apostolic Faith Church in Appalachia, Virginia; thirty people attended the final public meeting.  Both public meetings were noticed in the Virginia Register and open to a 30-day public comment period.  The comment period for the second meeting was extended in response to stakeholder requests.  The TMDL was revised to address stakeholder comments and re-noticed for a new comment period from July 11, 2005 through August 11, 2005. Numerous written comments were received and responded to by the state.